REMARKS

Review and reconsideration on the merits are requested.

Amendments to the Specification

Throughout the specification and the claims, the term "chill" has been amended to "chill crystal(s)" to clarify that the "chill" refers to the crystals of fine equiaxed grains of the particular size formed with the instantaneous formation of a large number of nuclei near the cooling roll surface.

This amendment finds support at page 26, lines 19-21, where the meaning of "chill" is originally defined.

On page 17, lines 22-23 of the specification, the phrase "lower than that of the nucleating portions, and may be made in the form of convex portions" has been amended to --lower than that of the nucleating portions.

The nucleating portions may be made in the form of convex portions--.

This amendment is made to clarify that the nucleation inhibiting portions are concave, and the nucleating portions are convex. That is, the first sentence of the last paragraph of page 17 with the subject "the nucleation inhibiting portions" should have been ended at the end of the first phase before "and", and the second phrase after "and" should have been divided into a second sentence with the subject "the nucleating portions".

This amendment finds support throughout the specification, in particular, at the end of the relevant paragraph and the next paragraph on page 18.

Amendments to the Claims

Claim 1

Claim 1 is amended by replacing the term "of" in line 2 with "said alloy flakes having" to clarify that it is the alloy flakes, not the sintered magnet, that have the claimed alloy structure.

Claim 1 is further been amended by rewriting and limiting the definition of element "M" to clarify that "M" represents at least one element selected from the group consisting of transition metals, silicon, carbon, and mixtures thereof, and iron is the essential element contained as element M.

This amendment finds support at page 13, lines 5-10 of the specification.

Claim 1 is finally amended by limiting the conditions for supplying and solidifying the alloy melt in step (B).

This amendment finds support at page 21, lines 19-26 and page 29, lines 22-26 of the specification.

Claim 9

Claim 9 is amended by rewriting and limiting the definition of element "M" to clarify that "M" represents at least one element selected from the group consisting of transition metals, silicon, carbon, and mixtures thereof, and iron is the essential element contained as element M.

This amendment finds support at page 13, lines 5-10 of the specification.

Objection to the Specification

With respect to the objection based on the meaning of the word "chill" in the context of the specification not being clear, this term is amended as earlier discussed.

Objection was also raised as to the nucleation inhibiting portions described as convex at page 17, line 23, though the balance of the specification gives this description as concave.

The relevant paragraph has been amended to clarify that the nucleating inhibiting portions are concave and the nucleating portions are convex, as earlier discussed.

Withdrawal is requested.

Rejection Under 35 U.S.C. § 112, Second Paragraph

With respect to the meaning of the term "chill" not being clear, this has been amended as earlier explained.

With respect to the meaning of the phrase "the balance M including iron" being not clear, the relevant claims have been amended by rewriting and limiting the definition of "M".

Withdrawal is requested.

Art Rejections

Claims 1-8 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent Application Publication No. 2004/0245491 Arai et al (Arai).

This rejection is respectfully traversed.

The Examiner's position is set forth in the Action and will not be repeated here so as to avoid undue length, except as necessary to an understanding of Applicants' traversal. A similar approach is taken with the later traversed art rejection of claims 9-13.

Traversal

Arai teaches R-Fe-B alloy powder for producing a <u>bonded</u> magnet, as disclosed in paragraph [0002].

In contrast, the alloy flakes obtained by the method set forth in claims 1-8 of the present application are for producing a <u>sintered</u> magnet (as also set forth in claim 9).

The magnetic properties required for a bonded magnet and a sintered magnet are different, and, accordingly, these two kinds of magnets are produced under different conditions.

Taking this fact into consideration, the difference between the present invention and Arai is discussed below.

The Examiner points out that Arai teaches that the cooling roll has ridges and grooves, and the grooves preferably have a width of 0.5 to 90 μm.

The Examiner further points out that teachings are not limited to preferred embodiments, and include a width of more than 100 μm required for the nucleation inhibiting portions of the present invention, which are rendered obvious by Arai.

However, it must be understood that in this art the functions of the nucleation inhibiting portions of the present invention are different from those of the grooves of Arai. Specifically, the nucleation inhibiting portions of the present invention are provided for inhibiting formation of nuclei, whereas the grooves of Arai are dimple correcting means ([0098]).

The dimples referred to in Arai are detrimental hollows formed by gas entering between the roll surface and the puddle of the molten alloy, which will cause coarsening of crystal grains ([0096]).

Arai teaches that the width of the grooves is preferably 0.5 to 90 μm, more preferably 1 to 50 μm, and if the width exceeds 90 μm, large dimples may be produced at the portions of the grooves, so that the crystal grains become coarse ([0101]). The widths of the grooves employed in the Examples of Arai are not more than 30 μm.

Arai also teaches various other conditions for inhibiting the coarsening of crystal grains, such as the pitch between the adjacent grooves, and the peripheral velocity of the cooling roll.

The grooves taught in Arai as dimple correcting means are intended to inhibit the coarsening of crystal grains due to the formation of dimples, and not intended for inhibiting the formation of nuclei as in the present invention.

Arai also teaches that the melt spun ribbon obtained by the Arai method is subjected to heat treatment for recrystallization of the amorphous structure and homogenization of the structure for giving desired magnetic properties as a bonded magnet, and to obtain a structure in which microcrystals are included in an amorphous structure ([0148], [0150]).

Arai further teaches that the magnetic powder obtained by milling such a melt spun ribbon has an average crystal grain size of as small as preferably equal to or less than 500 nm, more preferably equal to or less than 200 nm, and most preferably lie in the range of 10-120 nm. If the average crystal grain size exceeds 500 nm, magnetic properties, especially coercive force and rectangularity, cannot be sufficiently improved ([0160]). The average crystal grain sizes after the heat treatment disclosed in the Examples of Arai are as small as 40 nm or less.

In summary, the purpose of Arai is to increase the cooling rate uniformly over the alloy melt to obtain a fine and homogeneous crystal structure. This is because the melt spun ribbon of Arai is used to produce a bonded magnet, and, accordingly, the alloy melt must be cast into melt spun ribbons at such a high cooling rate to give an amorphous structure to the ribbon, to inhibit formation of dimples, and to inhibit coarsening of the crystal grains.

Even if the width of the grooves taught in Arai is a non-restrictive preferred range, a skilled person in the art, based on the teachings of Arai, would not make the width of more than 100 μm, which is larger than the preferred maximum of 90 μm and thus may cause coarsening of the crystal grains against the basic object of Arai.

Further, Arai is totally silent about obtaining larger crystal grains including the R-rich region and the dendrites of the $R_2Fe_{14}B$ phase having the average size of not smaller than 40 μm, as called for in amended claim 1 of the present application.

To produce a sintered magnet from the resulting alloy flakes, the method of the present invention must be practiced to provide an alloy structure having a 2-14-1 dendrite phase content as high as not less than 80 vol%, a low chill crystal content, a small interval between the R-rich regions, and large crystal grains having the R-rich region and the dendrites of the 2-14-1 phase observable under a polarization microscope.

Thus, the cooling rate in the method of the present invention should be rather low to insure the α-Fe phase is not generated, and is not as high as in Arai to form an amorphous structure.

As discussed above, amended claim 1 now clearly defines that the alloy melt is cooled under such conditions as to generate an alloy structure having an average size of crystal grains of not smaller than 40 μm, which clearly is distinguished from the conditions for producing alloy ribbons for a bonded magnet.

Therefore, claim 1 and claims 2-8 depending therefrom are not obvious over Arai.

Withdrawal of the art rejection is requested.

Claims 9-13 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent Application Publication No. 2005/0028892 Sasaki (Sasaki).

Claim 9 of the present application defines that the average size of crystal grains including the R-rich region and the dendrites of the $R_2Fe_{14}B$ phase in the alloy structure is not smaller than 40 μm.

The Examiner points out that Sasaki teaches that the grain size of the alloy is less than 50 μm (Comparative Example 25, paragraph [0246]), which overlaps the grain size of not less than 40 μm recited in present claim 9.

The part of Sasaki referred to by the Examiner reads:

"[T]he bonded magnet produced in Comparative Example 25 ... contains a large number of comparatively small grains having a grain size of 50 μm or less produced through HDDR treatment or pulverization. The poor magnetic characteristics are attributable to such a small grain size". (underscoring added to quotation)

It appears that literally "grain size" here means the "crystal grain size", but the described size actually would be understood by one of ordinary skill in the art to mean "powder particle size of 50 μm or less".

Referring to paragraph [0219] of Sasaki that reads as follows:

"[T]he alloy powder for producing bonded magnets has a mean particle size of 50 to 300 μm, which is considerably greater than that of the alloy powder for producing sintered magnets. When the bonded magnet alloy flakes undergo HDDR treatment, crystal orientation of recombined crystal grains of sub-micron size coincides with ...", (underscoring added to quotation)

One of ordinary skill in the art would understand this to teach as follows:

1) the alloy powder for producing bonded magnets has a mean "powder particle size" of 50 to 300 μm, and 2) the alloy flakes which undergone HDDR treatment have a "crystal grain size" on the order of sub-micron.

Reference is also made to Example 24, paragraph [0243] of Sasaki which reads:

"The resultant alloy powder was pulverized ... to have a particle size of 150 μm or less". (underscoring added)

The bonded magnet prepared in Comparative Example 25 is compared to the magnet prepared in Example 24, and is said to have poor magnetic characteristics attributable to a small "grain size".

From this disclosure, one of ordinary skill in the art would conclude that the "grain size of 50 μm or less" in paragraph [0246] of Sasaki actually means the "powder particle size of 50 μm or less", since the "crystal grain size" should be on the order of sub-micron while the "50 μm or less" here is said to be small.

Therefore, one of ordinary skill in the art would not understand the "grain size of 50 μm or less" in paragraph [0246] of Sasaki as it literally reads, but would rather understand that the phrase actually means "the powder particle size of 50 μm or less".

Accordingly, claim 9 defining the "crystal grain size of not smaller than 40 μm" and claims 10-13 depending therefrom are not obvious over Sasaki.

Withdrawal is requested.

The Substitute Specification

No new matter has been added to the substitute specification (marked-up copy, clean copy).

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

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